Following precedent, there will be a score of invited addresses, each of an hour's length, and sectional meetings for the presentation of short papers.

An innovation will be four conferences, something after the pattern of recent international gatherings in Moscow for topology and in Zurich for probability. There will be a conference on algebra, with Professor A. A. Albert as chairman, one on probability, the theory of measure and allied topics, with Professor Norbert Wiener as chairman, one on topology, with Professor Solomon Lefschetz as chairman and one on mathematical logic, with Professor H. B. Curry as chairman. These conferences will give an opportunity for specialists to exchange information and opinion among themselves, and also to disseminate new and important results to the mathematical public at large. The program will include formal lectures and informal open discussion.

The short papers will be presented in six sections:

I. Algebra and Number Theory.
II. Analysis.
III. Geometry and Topology.
IV. Probability, Statistics, Actuarial Science, Economics.
V. Mathematical Physics and Applied Mathematics.
VI. Mathematical Logic and Philosophy.

A session on history and didactics will be held in connection with the congress, with the cooperation of the Mathematical Society of America.

The short papers will preferably be in one of the official languages of the congress: English, French, German or Italian, and in general will not exceed ten minutes in length.

Among the entertainment features provided will be a reception, a garden party, a symphony concert and a banquet. Several excursions will be planned, and it is hoped that many American mathematicians who have automobiles with them will cooperate with the entertainment committee in arranging additional trips for the foreign visitors to be made out of Cambridge.

Effort will be made to facilitate the travel at reasonable cost of foreigners while they are in the United States. Previous to the congress, opportunity will be given to foreigners to see New York City under the guidance of some mathematician. The New York World's Fair will probably still be in progress at that time. Excursions to Washington, Niagara Falls and other places will be arranged if there is demand.

Besides the support from Harvard University, the Massachusetts Institute of Technology and other institutions in the neighborhood, generous subventions have been subscribed for by the Carnegie Corporation, the Institute for Advanced Study, the National Research Council and the Rockefeller Foundation.

All persons, whether they expect to be present in person or not, may register for the congress. The fee for regular members is $10.00. These will receive the Proceedings of the congress. Members of families and others not participating in the scientific activities may become associate members, for which the fee is $5.00. Detailed information will be sent in due time to all members of the American Mathematical Society, as well as to all interested persons who file their names in the office of the American Mathematical Society at 531 West 116th Street, New York City.

REPORTS

GRANTS FOR RESEARCH OF THE AMERICAN PHILOSOPHICAL SOCIETY

GRANTS AWARDED FROM THE PENROSE FUND

April, 1938[1]

Frank T. Gucker, Jr., Northwestern University, for technical assistance in determining the heat capacities and heats of dilution of solutions of the simpler amino acids and their uncharged isomers ..... $ 650

Kenneth N. McKee, New York University, for travel and other expenses in connection with the study of the French theater during the Revolutionary period 600

William J. Robinson, New York Botanical Garden, for the study of the condition necessary for the unlimited growth of excised tissues of higher plants, primarily excised root tips 1,500

E. J. Workman and R. E. Holzer, University of New Mexico, to make electrical measurements of the surface field under thunder clouds and charge distributions within the clouds for the purpose of studying quantities of electricity involved in lightning discharges 750

June, 1938

Biological Abstracts, Supplementary support for the publication of abstracts from biological journals of the world 5,000

Edward Girden, Brooklyn College, for supplies in connection with studies on cerebral mechanisms and hearing—localization of the cortical determinants for specific auditory frequencies tested by the L-R discrimination. (2nd grant) 400

Arthur L. Hughes, Washington University, for assistance and apparatus in the study of (a) the distribution of velocities among atomic electrons and (b) conductivity and, in particular, the photoconductivity of insulating liquids and solids 650

Mary R. Haas, Eufaula, Oklahoma, for travel and necessary expenses in making a special field investigation of the history and development of the extant towns which formerly comprised the powerful Creek Confederacy. New information concerning their recent history is to be obtained through a study of the consequences wrought by historic catastrophies (*e.g.,* the Civil War) in which they as well as their white neighbors shared. New information concerning their earlier history to be obtained through a study of the dialectic variations exhibited by the different towns, since the conservatism of language retains evidence of earlier historical connections long after they have passed from memory 1,250

[1] Other grants made in April were announced previously.

William Steel Creighton, College of the City of New York, for the completion of a handbook of North American ants begun in collaboration with the late Dr. W. M. Wheeler 700

William C. Stadie, University of Pennsylvania, for technical assistance in connection with the study of chemical action of insulin upon the intermediary metabolism of isolated, surviving tissue of normal and pathological animals 1,500

William Henry Brown, Johns Hopkins University, for technical assistance in the study of the phylogenetic classification of flowering plants 2,000

Ronald L. Ives, Science Service, for expenses in collecting evidence of glaciation, etc., from reservoir sites of Colorado-Big Thompson Diversion project before they are submerged by water and used as fill in dams, etc. 180

Christianna Smith, Mt. Holyoke College, for technical assistance in (a) the study of age involution of the thymus gland and the analysis of the factors behind the formation of Hassall's corpuscles and (b) the fetal liver during its hematopoietic stage in tissue culture 600

Ludvig Gustav Browman, Montana State University, for equipment for the study of oestrous and activity rhythms, and reproductive behavior of rats born and kept in constant darkness as contrasted with those kept in constant light 260

Josiah Cox Russell, University of North Carolina, for travel and other expenses in connection with studies in the history of the population of Medieval England 1,500

R. T. Hill, Indiana University School of Medicine, for technical assistance and supplies in an investigation of the androgenic function of ovaries 1,000

Carl C. Lindegren, University of Southern California, for technical assistance in the analysis of the mechanism of crossing-over by growing to maturity the plants produced from the spores of *Neurospora crassa*. (2nd grant) 500

Martin Kilpatrick, University of Pennsylvania, for research assistant and materials for the determination of relative acid strengths in aqueous and non-aqueous solutions 1,000

Frank E. E. Germann, University of Colorado, for technical assistance and supplies in the study of anomalous double refraction observed by Germann and Metz of solutions of certain inorganic salts in water to determine whether the effect is due to ions or to molecules formed by hydrolysis 2,000

Jean Broadhurst, Columbia University, for technical assistance and apparatus in the development of a virus test for scarlet fever susceptibility and immunity 1,750

C. L. Turner, Northwestern University, for field work in Mexico on the study of viviparity in teleost fishes; evolution of structures associated with viviparity in the family of Goodeidae, a group of fishes confined to the Mexican Plateau and adjacent regions 250

Horace G. Richards, New Jersey State Museum, for travel expenses in connection with the collection of land and fresh-water mollusks from the Corn Islands, Nicaragua, and adjacent mainland; study of these mollusks with particular attention to their bearing on problems of paleography. (3rd grant) 250

S. C. Brooks, University of California, for assistance in the study of the penetration of alkali and alkaline-earth metal ions and halides as a function of time and concentration, and metabolism of the protoplasm and sap of living plant cells 200

Philadelphia Institute for Medical Research, for assistance and supplies in the continuation of studies, through succeeding generations of the role of the thymus in the rate of growth and development of the young. (4th grant) 2,000

Peter J. Rempel, University of Southern California, for field work assistance, etc., in the study of several plant associations, namely, conifer forest, chaparral, pinyon pine woodland and desert, on the desert side of the San Jacinto and Santa Rosa ranges, California, and in chaparral on the seaward side of the same mountains, with respect to the differences in their environmental complexes and the phytometric responses in growth occasioned by these, with a view to elucidate some of the reasons for the vegetational differences 500

Donald Young Solandt, University of Toronto, for apparatus in an experimental study of the accommodation process in the excitation of irritable tissues with special reference to the excitation of single cells of such tissues 350

Nathaniel E. Griffin, Cambridge, Mass., for support of an investigation of the sources and influence of the "Historia Destructionis Troiae" of Guido de Columnis (to form Volume 2 in a 3-volume edition of this work) 500

October, 1938

Montague Francis Ashley-Montagu, Hahnemann Medical College, for travel and clerical assistance in a study of the development of interest in the comparative anatomy of the Primates as illustrated by the life and work of Edward Tyson (1650–1708) 400

Gaylord P. Harnwell, University of Pennsylvania, for the construction of a new type of β-ray spectrograph to investigate the β-ray spectra of electron-emitting and positron-emitting radioelements 1,000

Roberts Rugh, Hunter College and Columbia University, for assistance and supplies for: (1) comparative study of the morphology and physiology of the urino-genital systems of Amphibia; (2) study of the effect of hypophysectomy on the testis of the immature and mature bullfrog; and (3) study of the susceptibility of frog gametes to x-radiation prior to and subsequent to fertilization 350

Astronomical Hollerith-Computing Bureau, Columbia University, for assistance and materials in the preparation of a punched card catalogue of the data contained in the Boss General Catalogue of 33,342 stars and of other quantities derived from these 1,200

Jacob Klein, St. John's College, Annapolis, for a close study of classical physics, its problems, principles and origins starting from the work of Galileo 1,200

J. Bennett Nolan, Reading, Pa., for clerical assistance in the preparation of an annotated edition of the diary of Henry Marchant (1741–1796) 100

Jean Piatt, University of Vermont, for assistance and apparatus in an investigation of the factors underlying the anatomical and physiological specificity which exist between any given muscle and the nerve which supplies it; the nerve-muscle specificity problem 500

Malcolm Dole, Northwestern University, for technical assistance in a study of the effect of negative ions on the glass electrode 800

Karl F. Herzfeld, Catholic University of America, for a research associate in an experimental investigation of the physical theory of the connection between molecular structure and the absorption spectrum of organic compounds. (2nd grant) 1,200

Thomas Hume Bissonnette, Trinity College, Hartford, for assistance and supplies in an investigation of sexual photoperiodicity in animals and related phenomena 1,000

Harry Richard Seiwell, Woods Hole Oceanographic Institution, for an assistant in the investigation of internal waves in the North Atlantic Ocean ... 1,200

T. M. Sonneborn, Johns Hopkins University, for technical assistance in the study of the genetics of Paramecium—the analysis of the mechanism of inheritance, particularly inheritance of mating type. (2nd grant) 900

Fred A. Berkley, Montana State University, for travel and supplies for a bibliographical and herbarium study in preparation of a monograph of the Anacardiaceae (Sumac family) 550

R. G. Herb, University of Wisconsin, for supplies in connection with studies in nuclear physics by means of a 2.4 million volt electrostatic generator 400

Fred E. D'Amour, University of Denver, for technical assistance and supplies in connection with the study of the endocrine control of ovulation and related physiologic changes. (2nd grant) ... 1,000

E. B. Babcock, University of California, for technical assistance in the cytogenetic investigations in the Cichorieae and their bearing on taxonomy, phylogeny and evolution of the higher plants 400

Eliot R. Clark, University of Pennsylvania, for technical assistance in the continuation of the study of the growth and behavior of various cells, tissues and organs as observed microscopically in the living mammal, with the aid of permanently installed transparent chambers and windows. (2nd grant) 300

Robley D. Evans, Massachusetts Institute of Technology, for technical assistance, equipment and supplies for an international interchecking program to evaluate, correlate and extend the scattered knowledge of the radioactivity of natural materials 3,000

Arthur M. Banta, Brown University, for a research assistant in the study of the effect of the characters (phenotype) of the mothers upon the characters (phenotype) of her offspring, apart from her genetic constitution (genotype) 1,200

Gregory Pincus, Clark University, for a research assistant in the study of metabolism of rabbit eggs and embryos in different inbred strains and in hybrids between them, with particular reference to the metabolic basis of size differences in early ova 1,200

Nabih Amin Faris, Princeton University, for photographic supplies and photostats for a critical and comparative study of the Arabic calligraphy based on old manuscripts, with a view to determining the development of the Arabic characters, diacritical points and vowel signs 300

Edwin R. Helwig, University of Pennsylvania, for African travel expenses in connection with the study of the phylogenetic history of the chromosome complex in the Orthoptera 350

John Edward Dinsmore, Herbarium of the American Colony, Jerusalem, Palestine, for travel and technical assistance in a study of the taxonomy of the iris in Syria and Palestine and the discovery of new species 300

GRANTS AWARDED FROM THE ELDRIDGE REEVES JOHNSON FUND

Academy of Natural Sciences of Philadelphia:

Geology and Paleontology Department, for assistance in the study of type and undescribed specimens of fossils in the academy's collection in preparation for the making of a published, annotated and illustrated list of such specimens, including new material not heretofore described or illustrated 3,580

Henry W. Fowler, for the publication of a report on the fishes obtained by the George Vanderbilt South Pacific Expedition of 1937, comprising over 25,000 specimens, new species, rare or little known forms, besides extensive items in distribution, variation, taxonomy, etc. Publication to be a number of the "Monograph" series of the academy 1,500

Samuel George Gordon, for travel expenses in making a mineralogical survey of the Atacama Desert, Chile 920

Francis W. Pennell, for travel expenses, photography, etc., in making a study of the Scrophulariaceae of Western Temperate North America on a taxonomic, geographic and phylogenetic basis 500

H. Radclyffe Roberts, for field work and transportation in making a distributional and taxonomic study of the Orthoptera of Mexico and especially their relation to the Orthopteran fauna of the United States 500

University Museum, University of Pennsylvania:

Alan Rowe, for printing and editorial work in the publication of his manuscript, "The Four Canaanite Temples of Beth Shan." This volume deals with the temples of Rameses II, Seti I and Amenophis III excavated by the Palestinian Expedition at Beth Shan 2,500

V. J. Fewkes, for printing and editorial work in the publication of his manuscript "Excavations at Homolka," a final report of the completed investigation of an aneolithic fortified camp site in Czecho-Slovakia with an occupation period of several hundred years 1,000

H. U. Hall, for printing and editorial work in the publication of his manuscript entitled "Studies of the Sherbro Tribe, Sierra Leone," a report of the expedition to Sierra Leone, West Africa, conducted during 1936–37 1,000

Frederica de Laguna and Kaj Birket-Smith, for printing and editorial work in the publication of their manuscript entitled "Ethnology of the Eyah Indians of Alaska," covering ethnological material obtained by a joint expedition of the University Museum and the Danish National Museum in 1933 1,200

J. Alden Mason and Linton Satterthwaite, Jr., for architectural and editorial work in the completion of their manuscript and architectural drawings for their report entitled "Excavations at Piedras Negras," a final publication of seven years' work at the site of the ancient Maya city of Piedras Negras, Guatemala, including architectural studies of the temples and palaces which have been uncovered by the expedition as well as studies of the artistic and historical material found at the site 1,300

Eldridge Reeves Johnson Foundation for Medical Physics, University of Pennsylvania:

Leslie A. Chambers and J. B. Bateman, for mate-

rial, equipment and technical assistance in the study of the molecular organization of cell surfaces in relation to biological activity and specificity 1,500

Detlev W. Bronk, for material, equipment and assistance in the study of the mechanism of chemical excitation of nerve cells 1,800

Detlev W. Bronk, for material, equipment and assistance in making a general investigation of the nervous control of body organs in terms of the properties of nerve cells and fibers which make up the sympathetic and para-sympathetic nervous systems; with special reference to the physico-chemical processes which occur within these systems 2,050

H. K. Hartline, for material and equipment in connection with the study of the photo-chemical and neural processes of vision 1,500

SPECIAL ARTICLES

IDENTIFICATION OF THE FILTRABLE, TRANSMISSIBLE NEUROLYTIC AGENT ISOLATED FROM TOXOPLASMA-INFECTED TISSUE AS A NEW PLEUROPNEUMONIA-LIKE MICROBE

THE isolation from Toxoplasma-infected tissues of a filtrable, transmissible agent capable of producing a characteristic nervous disease in mice was reported recently.[1] The nature and origin of this agent was perplexing because (a) it was not demonstrated in thousands of normal mice, (b) it did not appear to possess the properties necessary for natural host-to-host transmission either by itself or by means of an arthropod vector, and (c) it appeared to be intimately associated with certain strains of Toxoplasma. The morphological appearance of the minute structures observed intracellularly and extracellularly in some of the infectious material suggested a similarity (a) to "chromatin" structures within the Toxoplasma and (b) to stages described for the causative agents of pleuropneumonia and agalactia. The relationship to "chromatin" structures of Toxoplasma, admittedly a fantastic concept, was rendered even more so by the finding that they were Feulgen-positive, while the structures in the "neurolytic agent" material were Feulgen-negative. The relationship to the causative agents of pleuropneumonia and agalactia appeared unlikely at first because their minimal size of 125–150 mμ and their capacity to grow in a cell-free medium containing serum differentiated them from the neurolytic agent material which appeared to have a minimal size of 314 to 360 mμ and failed to grow in serum-containing media.

By a modification of technique, however, it has proved possible to grow the "neurolytic agent" in a cell-free medium, consisting of ordinary nutrient broth, 10 per cent. Seitz-filtered, sterile, bovine serum and 0.5 per cent. glucose. No growth was perceptible in the initial cultures, but one or two transfers of the apparently negative cultures to fresh medium invariably showed a faint opalescence which, upon dark-field examination, revealed structures not unlike those seen in "neurolytic-agent" infectious material. Successful cultures were thus obtained from each of six infectious brains—some of which had been kept in the dried state for months and others fresh—while simultaneous tests with the same medium to which no glucose was added failed in a number of instances; in the absence of serum, all attempts were negative. Subculture of the serum-glucose-broth cultures on serum-agar yielded colonies 20 to 100 μ in size, which on direct microscopic observation and study of Giemsa-stained impression films were quite similar to those described by Ledingham[2] for pleuropneumonia and agalactia. The evidence that the cultivated microorganisms are identical with the "neurolytic agent" is as follows:

(1) More than 18 subcultures have now been obtained, and the cultures continue to show in mice the same pathogenic effects (both clinical and pathological manifestations) as the animal-passage material.

(2) The active agent is filterable, although with culture material a smaller size was obtained for the minimal infectious particle (determined by animal inoculation as well as by culture), *i.e.*, 250 to 292 mμ instead of 310 to 360 mμ.[3]

(3) Its pathogenicity is inactivated at the same temperature (about 45° C. for 15 minutes).

(4) The cultivated and animal-passage materials give rise to complete immunity against each other.

Elaboration of exotoxin in vivo and in cultures: In the first report[4] it was indicated that the brain lesions produced after intraperitoneal or intrathoracic inoculation were not caused by the transmissible agent itself but rather by some non-transmissible substance formed when growth occurred in certain sites. Filtration of cultures through Seitz filters, which hold back the infective particles, yielded a material which upon intravenous injection (but not intracerebral or intraperitoneal) of 0.5 cc amounts in 3-weeks-old mice (old mice react irregularly or not at all), reproduced the typical nervous signs within 1 to 2 hours. Most of these mice died within a few hours, but the surviving ones continued with the nervous signs and exhibited

[1] A. B. Sabin, SCIENCE, 88: 189, 1938.

[2] J. C. G. Ledingham, *Jour. Path. Bact.*, 37: 393, 1933.

[3] Gradocol membranes and filters were kindly supplied by Dr. J. H. Bauer.

[4] A. B. Sabin, *loc. cit.*